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RESEARCH ARTICLE

Effect of different seed treatments on occurence of natural enemies in soybean ecosystem

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ABSTRACT

The present investigation entitled "Effect of different seed treatments on occurence of natural enemies in soybean ecosystem" was undertaken during 2012-13 under field condition in the Insectary, Entomology section, College of Agriculture, Nagpur. It was laid out in randomized block design with eight treatments and three replications. The effect of different seed treatments on germination percentage of soybean was significantly superior over untreated control (68%). Highest germination percentage (92%) was observed in imidacloprid 70 WS @ 12 g/kg and it was followed by thiamethoxam 25 WG @ 1.50 g /kg (90%). Maximum population of natural enemies (coccinellids, chrysopa and spiders) was observed in untreated control (2.066/plot) and was at par with imidacloprid 70 WS @ 12 g/kg (1.732/plot) while remaining seed treatmeants recorded natural enemies population in the range of 1.265 to 0.466 per plot. Yield data indicated that the treatment with imidacloprid 70 WS @ 12 g/kg obtained highest grain yield (1300 kg/ha) followed by thiamethoxam 25 WG @ 1.50 g/kg (1000 kg/ha) and these were found significantly superior over remaining seed treatmeants.

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INTRODUCTION

Soybean [*Glycine max* (L.) Merill.] is one of the most important leguminous and oilseed crops, belonging to family fabaceous. It grows in three seasons in most part of the world. As per first known record, the native of soybean is Asia and it emerged as domesticated crop around the eleventh century B.C. in China. Since centuries it was cultivated for oil and named as a "yellow jewel".

Soybean "the miracle golden bean of 20th century" has revolutionized the agriculture as well as generated economy of many countries like China and Japan (Balsubramanian, 1972). Soybean is used for preparation of breads, biscuits, cakes, chocolates and vegetables. Its milk is easy to digest and can be compared with cow milk (Anonymous, 1989). Its oil is employed in the manufacture of soap, paints, resin and dying.During 2011, area sown under soybean was 30.32 lakh hectare which was marginally less than 2010 (30.684 lakh ha) due to late onset of monsoon. District wise area under soybean cultivation also varied due to this effect of monsoon. Out of this area, about 30 per cent was sown in last week of June and 60 per cent was sown in first and second week of July (Anonymous, 2011).

Taware *et al*. (2000) tested the efficacy of some insecticides as seed treatment, soil application and spraying at early crop stage against early season insect pest of soybean. The highest seed yield was recorded in chlorpyriphos spray @ 1.5 a.i. kgha^{-1} at 8-10 DAG (3548 kg/ha) followed by thiamethoxam seed treatment @ 3 g and 5 g/ kg seed and phorate 10 G @ 10 kgha^{-1} as soil application before sowing.

The soybean share in global oil crop output is estimated at 44%. Indiscriminate use of pesticide caused to suppress natural enemies and increasing pest population of importance,

which asses known little doses of insecticides and all other compatible practices like seed treatment.

MATERIAL AND METHODS

The present investigation was conducted during *Kharif* 2012-13 at Entomology Section, College Agriculture, Nagpur. Systemic insecticides *viz.*, thiamethoxam 35 FS, thiamethoxam 25 WG, imidacloprid 70 WS, carbosulfan 25 EC and chlorpyriphos 20 EC were used as seed treatment, under field condition on soybean variety, JS-335 used during the course of present investigation.

Treatment details :

Sr. No.	Treatments	Dose/kg
T_1	Thiamethoxam 35 FS	0.9 g
T_2	Thiamethoxam 35 FS	1.05 g
T_3	Thiamethoxam 25 WG	1.33 g
T_4	Thiamethoxam 25 WG	1.50 g
T_5	Imidacloprid70 WS	12 g
T_6	Carbosulfan 25 EC	6ml
T_7	Chlorpyriphos 20 EC	4ml
T_8	Untreated control	-

Treatment application :

Required quantity of soybean seeds and insecticides were put in polythene bag and mixed thoroughly. Few drops of water *i.e.* @ 2 ml 100 g^{-1} seed were sprinkled on the mixture of seeds and insecticide. The mixture was stirred frequently till uniform coating of insecticides occurred. The treated seeds were spread on a paper in a room and kept overnight for drying.

Methods of recording observations :

Eight treatments with three replications were used for the studies on the effect of thiamethoxam, carbosulfan, chlorpyriphos and imidacloprid at varying concentrations.

Germination percentage :

One hundred soybean seeds of each treatments were sown in another place, at just adjacent to the experimental area. Total number of germinated seeds from total sown seeds were counted 7 days allowing sowing and germination percentage was worked out.

Natural enemies :

Observations on the predators *viz.*, coccinellids, chrysopa and spider were recorded on each treatment plot.

Yield data :

Observations on yield of soybean grains were recorded from each plot at the time of threshing and converted into $kgha^{-1}$ and statistically analyzed.

Statistical analysis :

The data collected during the course of experimentation were subjected to statistical analysis with appropriate transformation for interpretation of results in Randomized Block Design (RBD) in order to test the level of significance among the various treatments (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The results of the present study alongwith relevant discussion have been presented as under :

Effect of different seed treatments on germination percentage of soybean :

The results on the effect of different seed treatments on germination percentage of soybean are presented in Table 1.

Significantly highest percentage of germination was recorded in treatment imidacloprid 70 WS @ 12 g/kg (92%) and was at par with thiamethoxam 25 WG @ 1.50 g kg^{-1} (90%). The remaining seed treatments *viz.*, thiamethoxam 25 WG @ 1.33 g kg^{-1}, thiamethoxam 35 FS @ 1.05 g kg^{-1}, thiamethoxam 35 FS @ 0.9 g kg^{-1}, carbosulfan 25 EC @ 6 ml kg^{-1}, chloropyrphos 20 EC @ 4 ml kg^{-1} exhibited 80, 75, 74, 74 and 72 per cent seed germination, respectively. Whereas, the lowest germination percentage (68%) was observed in untreated plot (Table 1).

Table 1 : Effect of different seed treatments on germination percentage of soybean

Sr. No.	Treatments	Dose kg^{-1}	Germination percentage (%)
T_1	Thiamethoxam 35 FS	0.9 g	74
T_2	Thiamethoxam 35 FS	1.05 g	75
T_3	Thiamethoxam 25 WG	1.33 g	80
T_4	Thiamethoxam 25 WG	1.50 g	90
T_5	Imidacloprid 70 WS	12 g	92
T_6	Carbosulfan 25 EC	6 ml	74
T_7	Chlorpyriphos 20 EC	4 ml	72
T_8	Untreated control	–	68
	SEm ±		0.771
	CD (P = 0.05)		2.342

Dawkhar (1992) also reported that seed treatment with Imidacloprid 70 WS @ 3, 4, 5 and 6 per cent showed higher germination percentage than thiamethoxam in cotton. Similarly, Ahire (2008) and Ganage (2009) recorded the highest per cent seed germination when soybean seed was treated with thiamethoxam 70 WS @ 3 and 6 g/kg and imidacloprid 70 WS @ 6 g/kg seed. Thus, the results of these findings are in comparison with the results of present investigation and gave support to the data.

Effect of different seed treatments on natural enemies in soybean :

The results on the effect of different seed treatments on natural enemies of soybeanare presented in Table 2.

The data (Table 2) on effect of different seed treatments on population of natural enemies were recorded in different treatment plot of experimental area and determined that, the significant population of predators *i.e.* coccinellids, chrysopa and spider were noticed in untreated control (2.066/plot) and was at par with imidacloprid 70 WS @ 12 g kgh^{-1} (1.732/plot) and carbosulfan 25 EC @ 6ml/kg (1.466 natural enemies/plot). The next effective treatment was chlorpyriphos 20 EC 4 ml/kg (1.265 natural enemies/plot) which was significantly superior to thiamethoxam 25 WG @ 1.50g/kg(1.133 natural enemies/ plot), thiamethoxam 25 WG @ 1.33 g/kg (0.799 natural enemies/ plot), thiamethoxam 35 FS @ 1.05 g/kg (0.732 natural enemies/ plot) and thiamethoxam 35 WG @ 0.9 g/kg (0.466 natural enemies/plot), respectively.

Effect of different seed treatments on yield of soybean :

The soybean trial plots were harvested separately at the end of season and yield of soybean grains obtained from different plots were recorded and the results on effect of different seed treatments on yield of soybean are presented in Table 3.

Significantly highest grain yield (1300 kg/ha) was obtained from plots treated with imidacloprid 70 WS @ 12 g kg^{-1} seed and it was superior to other treatments as thiamethoxam 25 WG @ 1.50 g kg^{-1} seed was second in order of merit recording (1000 kgha^{-1}.) and was found significantly superior to thiamethoxam 25 WG @ 1.33 g kg^{-1} seed, thiamethoxam 35 FS @ 1.05 g kg^{-1}, thiamethoxam 35 FS @ 0.9 g kgha^{-1}, carbosulfan 25 EC 6 ml/kg and chlorpyriphos 20 EC 4 ml kg recording 700,670,670,600 and 550 kg

Table 2 : Effect of different seed treatments on natural enemies in soybean

Sr. No.	Treatments	Dose kg^{-1}	Cumulative mean population of natural enemies per plot			Total population
			Coccinellids	Chrysopa	Spider	
T_1	Thiamethoxam 35 FS	0.9 g	0.200 (1.224)	0.133 (1.052)	0.133 (1.052)	0.466
T_2	Thiamethoxam 35 FS	1.05g	0.266 (1.343)	0.266 (1.343)	0.200 (1.224)	0.732
T_3	Thiamethoxam 25 WG	1.33 g	0.333 (1.462)	0.266 (1.343)	0.266 (1.343)	0.799
T_4	Thiamethoxam 25 WG	1.50 g	0.400 (1.581)	0.333 (1.462)	0.400 (1.581)	1.133
T_5	Imidacloprid 70 WS	12 g	0.600 (1.857)	0.466 (1.677)	0.666 (1.677)	1.732
T_6	Carbosulfan 25 EC	6 ml	0.533(1.774)	0.400 (1.581)	0.533 (1.774)	1.466
T_7	Chlorpyriphos 20 EC	4 ml	0. 466 (1.677)	0.333 (1.462)	0.466 (1.677)	1.265
T_8	Untreated control	–	0.666 (1.954)	0.600 (1.857)	0.800 (2.112)	2.066
SE(m) ±			0.173	0.096	0.103	
CD (P=0.05)			0.524	0.273	0.336	

Note: Figures in parentheses are square root transformed values

Table 3 : Effect of different seed treatments on yield of soybean

Sr. No.	Treatments	Dose kg^{-1}	Yield (kgha^{-1})			Total	Mean yield (kg ha^{-1})
			R1	R2	R3		
T_1	Thiamethoxam 35 FS	0.9 g	670	700	640	2010	670
T_2	Thiamethoxam 35 FS	1.05 g	670	680	660	2010	670
T_3	Thiamethoxam 25 WG	1.33 g	700	700	700	2100	700
T_4	Thiamethoxam 25 WG	1.50 g	1200	900	900	3000	1000
T_5	Imidacloprid 70 WS	12 g	1500	1300	1100	3900	1300
T_6	Carbosulfan 25 EC	6 ml	650	550	600	1800	600
T_7	Chlorpyriphos 20 EC	4 ml	570	580	490	1650	550
T_8	Untreated control	–	475	475	520	1470	490
SEm ±					0.773		
CD (P=0.05)					2.345		

ha^{-1} soybean yield, respectively. The lowest yield was obtained in untreated control (490 kg ha^{-1}).

The results of present investigation regarding yield are discussed in the light of findings of previous workers as Singh *et al*. (2000) recorded that seed treatment with thiamethoxam 70 WS @ 3 and 5 g kg^{-1} seed resulted in higher grain yield of 12.08 and 12.22 q/ha as against 9.08 q/ha in untreated control plot.

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